

What is claimed is:

1. A protection device for use in an AC power distribution system, the device being configured to be coupled between an AC power distribution system and at least one load, the device comprising:
  - a test circuit configured to generate at least one simulated fault signal during a first predetermined half-cycle of said AC power, the at least one simulated fault signal including a grounded neutral simulated fault signal;
  - a detector circuit coupled to the test circuit, the detector being configured to generate a detection signal in response to the at least one simulated fault signal;
  - a fault checking mechanism coupled to the detector, the fault checking mechanism being configured to generate an internal fault signal if the detection signal is not generated within a predetermined period of time; and
  - a response mechanism coupled to the fault checking mechanism, the response mechanism being configured to generate a response if the internal fault signal is generated.
2. The protection device of claim 1, wherein the response mechanism includes a circuit interrupter being configured to decouple the AC power distribution system from the at least one load.
3. The protection device of claim 2, wherein the detector circuit further comprises a ringing circuit configured to generate a ringing signal.
4. The protection device of claim 3, wherein the detection signal includes the ringing signal.

5. The protection device of claim 1, wherein the detector circuit further comprises a ground fault sensor configured to sense a ground fault condition.
6. The protection device of claim 1, wherein the detector circuit further comprises a grounded neutral sensor configured to detect grounded neutral conditions.
7. The protection device of claim 1, wherein the fault checking mechanism does not generate the internal fault signal when the detection signal is detected within a predetermined period of time.
8. The protection device of claim 2, wherein the detector circuit generates the detection signal during a second predetermined half-cycle in response to a fault in the AC power distribution system, the detection signal being configured to trip the circuit interrupter during the second predetermined half-cycle.
9. The protection device of claim 2, wherein the circuit interrupter includes a first and second solenoid, the first solenoid being activated by the fault checking mechanism, the second solenoid being activated by a fault in the AC power distribution system.
10. The protection device of claim 2, wherein said circuit interrupter includes a reset mechanism configured to reset the circuit interrupter after the AC power distribution system has been decoupled from the at least one load, such that the AC power distribution system is re-coupled to the at least one load.
11. The protection device of claim 10, further comprising a lock-out mechanism coupled to the reset mechanism, the lock-out mechanism being configured to prevent the reset mechanism from resetting if the AC power distribution system was decoupled from the at least one load in response to the internal fault signal.
12. The protection device of claim 10, further comprising:  
line terminals for electrical connection to the AC power distribution system;

load terminals for electrical connection to the load;  
a power supply coupled to the detector and fault checking mechanism, the power supply being configured to provide power to the protection device and prevent reset of the protection device if the load terminals are miswired to the AC power distribution system.

13. The protection device of claim 2, further comprising a miswire prevention circuit configured to trip the circuit interrupter if the load terminals are miswired to the AC power distribution system.

14. The protection device of claim 13, further comprising at least one auxiliary impedance circuit configured to protect the miswire prevention circuit from high frequency voltage impulses.

15. The protection device of claim 1, wherein said response mechanism includes an indicator for indicating the existence of a fault within said protection device.

16. The protection device of claim 15, wherein the response mechanism includes an audible indicator.

17. The protection device of claim 15, wherein the response mechanism includes an visual indicator.

18. The protection device of claim 2, wherein said response mechanism includes an indicator for indicating the existence of a fault within said protection device.

19. The protection device of claim 18, wherein the response mechanism includes an audible indicator.

20. The protection device of claim 18, wherein the response mechanism includes an

visual indicator.

21. The protection device of claim 2, wherein said fault checking mechanism includes a lock-out mechanism configured to prevent the circuit interrupter from being reset if there is a fault condition within the protection device.
22. The protection device of claim 1, wherein said fault checking mechanism includes a lock-out mechanism configured to prevent the circuit interrupter from being reset if the detection signal is not generated within a predetermined period of time.
23. The protection device of claim 1, further comprising:
  - a first power supply coupled to the detector circuit; and
  - a second power supply coupled to the fault checking mechanism, the operation of the fault checking mechanism being independent from the first power supply.
24. The protection device of claim 1, further comprising a power supply coupled to the detector and the fault checking mechanism, the power supply including redundant components.
25. The protection device of claim 2, further comprising a trip light indicator configured to light when the circuit interrupter is tripped.
26. The protection device of claim 1, further comprising at least one auxiliary impedance circuit configured to protect the test circuit, detector, and/or fault checking mechanism from high frequency voltage signals.
27. The protection device of claim 1, wherein the test circuit further comprises a grounded neutral simulation circuit.
28. The protection device of claim 1, wherein said protection device is at least one of a

GFCI device, a GFEP device, and an AFCI device.

29. A self testing protection device for use in an AC power distribution system, the device being configured to be coupled between an AC power distribution system and at least one load, the device comprising:

- a simulated grounded neutral test circuit configured to transmit a simulated grounded neutral fault signal during a first predetermined half cycle of AC power;
- a ground fault sensor coupled to the simulated grounded neutral test circuit, the ground fault sensor being configured to sense a ground fault condition and the simulated grounded neutral fault signal and provide a sensor signal in response thereto;
- a first detector coupled to the ground fault sensor, the first detector being configured to generate a first detection signal in response to the sensor signal;
- a resonant tank coupled to the first detector, the resonant tank being configured to generate a resonating signal in response to the first detection signal, the resonating signal indicating that protection device components are operational; and
- a second detector coupled to the resonant tank, the second detector being configured to generate an internal fault signal if the resonating signal is not detected by the second detector within a predetermined period of time.

30. The protection device of claim 29, wherein said resonant tank further comprises:

- a circuit interrupter configured to decouple the AC power distribution system and at least one load;
- a trip solenoid configured to trip the circuit interrupter;
- a switch configured to actuate the trip solenoid only during a second predetermined half cycle of said AC power source; and

a capacitor configured to energize the resonant tank during the first predetermined half cycle of AC power.

31. The protection device of claim 30, wherein the switch is selected from a group comprising a SCR and an electronic switch.
32. The protection device of claim 29, wherein the internal fault signal is configured to actuate the trip solenoid.
33. The protection device of claim 29, further comprising a reset mechanism, the reset mechanism being configured to reset the circuit interrupter such that the AC power distribution system is re-coupled to the at least one load.
34. The protection device of claim 33, wherein the internal fault signal is configured to disable the reset mechanism and prevent the protection device from being reset.
35. The protection device of claim 34, wherein the second detector includes an indicator that is energized in response to the fault signal.
36. The protection device of claim 29, wherein the second detector includes an indicator that is energized in response to the fault signal.
37. The protection device of claim 29, wherein the fault signal is configured to prevent the protection device from being reset.
38. The protection device of claim 29, wherein said protection device is at least one of a GFCI device, a GFEP device, and an AFCI device.
39. A method for self-testing a protection device for use in an AC power distribution system, the device being configured to be coupled between an AC power distribution system and at least one load, the method comprising:

introducing a simulated ground neutral fault during a first predetermined half cycle of the AC power;  
attempting to detect the introduced simulated grounded neutral fault during the first predetermined half cycle; and  
signaling a fault condition if the introduced simulated grounded neutral fault is not detected within a predetermined period of time.